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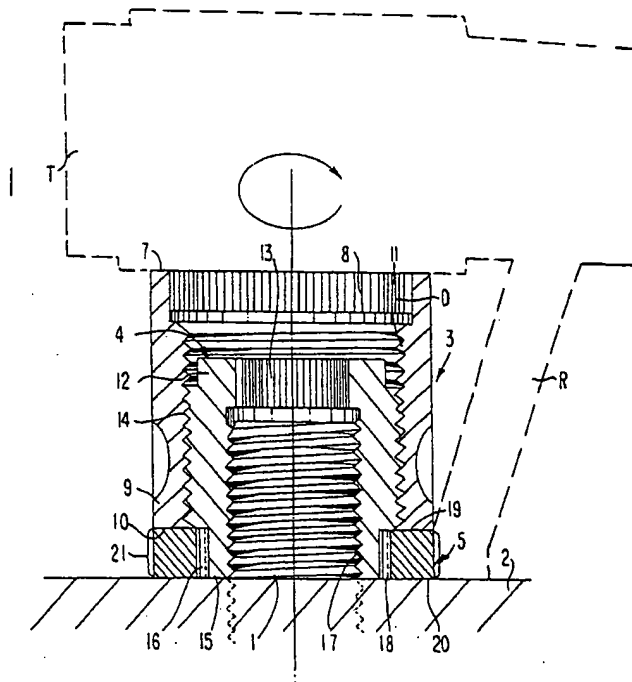
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(54) Method of and device for elongating and relaxing a stud or the like

(57) In order to elongate and relax a stud (1) or the like, a first part (4) which is movable only axially engages the stud, a second part (3) is connected with the first part (4) and a friction element (5) is connected with at least one of the parts (3,4) so that the first part (4) has more surfaces cooperating with other elements than the

second part(s). At least a holding force is applied to the friction element (5) while an opposite active force is applied to the second part (3) so that the second part (3) is moved in the transverse direction and the first part (4) is moved only axially to elongate or relax the engaged stud (1).

FIG. 1



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Description

This invention relates to a method of, and an arrangement for, elongating and relaxing a stud arranged in an object, such as, for example, a flange or the like.

Methods of the above mentioned general type are known in the art. For example, in order to elongate or relax a stud, it is known to use a mechanical nut having two elements which are moved relative to one another in opposite axial directions to elongate the stud or to relax it. There are however many applications where no gaskets are used to seal the two flange portions or where the stud is oversized relative to the required clamping force. Therefore, with a steel-to-steel flange connection there is no compression feasible, and with an oversized stud there is no stud elongation feasible, and thus axial movement of one of the parts becomes possible.

In US-A-5341560 there is disclosed a method of elongating and relaxing a stud in accordance with which a first part engages the stud, a friction element is connected with the first part, a second part is connected with the first part, and a holding force is applied to the first part while an opposite active force is applied to the second part via corresponding first and second engaging means so that the second part turns while the first part moves in the axial direction and elongates (relaxes) the stud. This method eliminates the disadvantages of the prior art. In some instances, however, the first part can be inaccessible, or it might be undesirable to apply the holding force to the first part. In any event, the mechanical tensioner described in US-A-5341560 can cooperate only with such a tool which has a central structure designed to apply a holding force to the first part, and an offset or surrounding structure designed to apply a turning force to the second part. Such tools are special tools, since in conventional tools the situation is just the opposite. In the centre of the tool there is always a drive part, while the housing, which can be used to apply a holding force or to carry a holding element, is offset relative to the central drive part or surrounds the drive part. It is believed to be clear that in many cases it is not desirable to provide a special tool for such a mechanical tensioner.

Accordingly, it is an object of the present invention to provide a method of, and a device for, elongating and relaxing a stud, which is a further improvement of the prior art methods and which eliminates the disadvantages of the prior art methods.

In keeping with these objects and with others which will become apparent hereinafter, one aspect of the present invention resides, briefly stated, in a method of elongating and relaxing a stud having an axis and arranged in an object, the method comprising the steps of connecting the stud with a first part which is movable only axially so as either to pull the stud in an axial direction to elongate the stud and thereby to tension it in the object or to relax the stud; moving the first part only ax-

ially by connecting the first part with a second part which is moveable in a transverse direction; connecting a friction element with the first part, so that the first part has more surfaces cooperating with other elements and subjectable to friction during movement than the second part and so that the second part is not connected with the friction element but instead is freely turnable relative to the friction element while freely abutting against the friction element, wherein in accordance with the invention at least a holding force is applied to the friction element while an opposite active force is applied to the second part so that the second part is moved in the transverse direction while the first part is moved axially to move the stud axially without turning and to elongate the stud.

In accordance with another feature of the present invention, a device for elongating and relaxing a stud is provided which includes the above mentioned first part engageable with the stud, a friction element connectable with the first part, a second part connectable with the first part, wherein the friction element has engaging means so that the friction element can be engaged and at least a holding force can be applied to the friction element.

When the method is performed and the device is designed in accordance with the present invention, a standard power tool can be used for cooperation with the device, which tool has a conventional central drive cooperating with the second part of the device for turning the second part, and a housing which is offset relative to the central drive or surrounds the central drive and can be provided with a holding element which applies a holding force to the friction element. Thus, no special tools are needed to operate a device according to the present invention.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Figure 1 is a view showing a cross-section of one embodiment of a device for elongating and relaxing a stud in accordance with the present invention;

Figures 2A and 2B are views showing a further embodiment of a device for elongating and relaxing a stud in accordance with the present invention;

Figure 3 is a view showing still a further embodiment of a device for elongating and relaxing a stud in accordance with the present invention; and

Figure 4 is a view showing an additional embodiment of a device for elongating and relaxing a stud

in accordance with the present invention.

Figure 1 shows a device according to the invention for elongating and relaxing a stud 1 which is arranged in an outside object such as a flange 2 or the like. In accordance with the invention, the stud 1 is engaged by an first or inner part 4 and is movable only axially to pull the stud in the axial direction so as to elongate it and thereby to tension it in the object, or to relax the stud as will be explained hereinbelow. The inner part 4 is moved only axially by means of a second or outer part 3 which is connected with the inner part 4 and is movable in a transverse direction. A friction element 5 cooperates with at least one of the parts 3 and 4 so as to change friction between the parts 3 and 4 as will be explained hereinbelow.

The outer part 3 has an end portion 7 remote from the flange 2 and provided with engaging formations, for example splines 8, to be engaged by a tool. The outer part 3 also has a portion 9 which faces toward the flange 2 and includes a surface 10 arranged to abut against the friction element 5. Finally, the outer part 3 has an inner thread 11. The outer part 3 can be formed as a tubular member provided with the above specified formations.

The inner part 4 is a tubular member having an end portion 12 remote from the flange 2 which is provided with a plurality of engaging formations, for example splines 13, to be engaged by a tool. The inner part 4 has an outer surface provided with an outer thread 14 which engages with the inner thread 11 of the outer part 3. The inner part 4 further has an end portion 15 having an outer surface provided with engaging formations, for example axially extending splines 16. Finally, the inner part 4 has an inner surface provided with engaging formations, formed, for example, as an inner thread 17, for engaging the stud 1.

The friction element 5 is disc-shaped and is located on the one hand between the end portion 9 of the outer part 3 and the flange 2 and, on the other hand, so as to surround the portion 15 of the inner part 4. The friction element 5 has an inner surface provided with a plurality of engaging formations, for example axially extending splines 18, which engage with the axially extending splines 16 of the end portion 15. The friction element 5 has an end surface 19 against which the surface 10 of the outer part 3 abuts and an opposite end surface 20 which abuts against the outer surface of the flange 2. Finally, the friction element 5 has an outer circumferential surface provided with a plurality of engaging formations, for example splines 21.

The inner thread 11 and the outer thread 14 have one direction, while the inner thread 17 has another direction. For example, the inner thread 17 can be a right-hand thread, while the threads 11 and 14 can be left-hand threads.

As described above the connecting means connecting the inner part 4 with the outer part 3 comprise

threads 11 and 14, while the engaging means connecting the inner part 4 with the friction elements 15 conveniently comprise the splines 16 and 18. The threads 11 and 14 are axially spaced from the interengaging splines 16 and 18.

It can be seen that the inner part 4 has four surfaces cooperating with other parts and subjectable to friction. These surfaces are the surface of the inner thread 17, the surface of the outer thread 14, the end surface abutting against the friction element 5, and the end surface abutting against the flange 2. In contrast, the outer part 3 has only two surfaces which are subjectable to friction, namely the surface of the inner thread 11, and the end surface 19 abutting against the friction element 5.

In order to elongate or relax the stud in accordance with the inventive method, a standard tool T (shown schematically in dashed lines in Figure 1) is employed. The tool is applied so that its drive part D around the central axis engages the splines 8 of the outer part 3 to turn the latter while a reaction part R of the tool which can be connected, for example, to the immovable housing of the tool, which surrounds the drive part D, engages the splines 21 of the friction element 5 so as to at least hold the friction element in order to prevent its rotation. When the outer part 3 is moved in a direction which is transverse to an axis of the tensioner and the stud, or more particularly is turned about this axis, its surface 10 abuts against the end surface 19 of the friction element 5 and therefore the outer part 3 cannot move axially downwards (in Figure 1) further onto the friction element 5. Under the action of turning of the outer part 3, and due to the cooperation between the threads 11, 14, the inner part 4 is displaced axially upwards (in Figure 1) along the cooperating axially extending splines 16, 18, but does not displace in the transverse direction or in other words does not turn around the axis. During these movements the friction element 5 is displaced neither in the transverse direction (turned around the axis) nor in the axial direction, i.e. it is immovable relative to the flange 2. The axial upward displacement of the inner part 4 without the transverse displacement (turning around the axis) causes pulling of the stud 1 upwardly so that it is elongated.

Thus due to inventive cooperation of the parts 3 and 4 and the friction element 5, which imparts a higher friction to the inner part 4 than the outer part 3 when a force is applied to one of the parts 3, 4 in a transverse direction to the axis (by applying a force to one part, by holding one part and turning another part, by applying a turning force to both parts in opposite directions with equal forces), after elimination of the gaps in the assembly, the outer part 3 moves in the transverse direction to the axis (rotates) while the inner part 4 moves only axially upwardly to pull the stud 1 axially upwardly.

It is to be understood that in order to relax the stud 1 the outer part 3 must be displaced in an opposite transverse direction (turned around the axis in an opposite direction), so that the inner part 4 is displaced axially

downwardly and the stud is therefore relaxed.

As can be seen in Figure 1 and described hereinabove, the inner part 4 is provided with splines 13. Therefore, instead of applying the holding force to the friction element by using a tool which engages the engaging means 21 of the friction element 20, the tool can engage the splines 13 of the inner part 4 and hold it exclusively, or in addition to the holding of the friction element 5.

As mentioned hereinabove, at least a holding force is applied to the friction element 5. However, it is possible to apply the friction element 5 an active force which acts in a direction opposite to the direction of action of the active force applied to the outer part 3. In other words, when one active force, for example the force applied to the outer part 3, acts in a clockwise direction, the force applied to the friction element 5 acts in counterclockwise direction.

A device in accordance with another embodiment of the present invention and shown in Figures 2A and 2B is used for elongating and relaxing a stud 101 which is arranged in an outside object such as a flange 102 or the like. The device has an inner or first part 104, an outer or second part 103, and a friction element 105 located between the inner and outer parts 104 and 103.

The outer part 103 has an end portion 107 provided with teeth 108 which can be engaged by a tool. The outer part 103 also has a surface 109 which faces toward the flange 102 and is arranged to abut against a facing surface 110 of the friction element 105. Finally, the outer part 103 has an inner thread 111.

The inner part 104 has a cylindrical first portion 112 which is distant from the flange 102 and has an outer surface provided with an outer thread 113 engageable with an inner thread 111 of the outer part 103. The inner part 104 also has an inner thread 114 engageable with an outer thread 115 of the stud 101. Finally, the inner part 104 has an axial second portion 116 which is polygonal and is provided with outer splines 117.

The friction element 105 is ring-shaped and on the one hand is located between the end portion 109 of the outer part 103 and the flange 102 and on the other hand surrounds the portion 114 of the inner part 104. The friction element 105 has an inner surface provided with a plurality of axially extending splines 118 engageable with the splines 117 of the portion 116 of the inner part 104.

An inner socket 120 has an end portion 121 provided with a plurality of teeth 122 engageable with the teeth 108 of the outer part 103. An outer socket 123 is turnable relative to the inner socket 120 and has a lower portion with an inner peripheral surface provided with inner splines 124 engageable with splines 125 provided on an outer peripheral surface of the friction element 105.

The inner socket 120 is connectable with a rotatable and axially displaceable part of a power tool (not shown), while the outer socket 123 can be connectable with an immovable part of a power tool.

During operation the outer non-rotatable socket 123 holds the friction element 105 non-rotatably by interengagement of the splines 124, 125 so as to apply at least a holding force to the friction element 105. The inner socket 120 is lowered so that its teeth 122 interengage with the teeth 108 of the second part 103, and an active rotary force is applied to the socket 120 and thereby to the outer part 103. The outer part 103 is rotated relative to the inner part 104 causing the inner part 104 to move axially upwardly (due to the cooperation of the threads 111 and 113). The inner part 104 pulls the stud 101 upwardly due to the cooperation of the threads 114, 115 without turning the stud relative to its axis, so that the stud 101 is elongated. Turning of the socket 120 in an opposite direction results in turning of the outer part 103 in the opposite direction and thereby moving the stud in an opposite axial direction so as to relax the stud.

A device in accordance with a further embodiment of the present invention and shown in Figure 3 is used for elongating and relaxing a stud 201 which is arranged in an outside object such as a flange 202 or the like. In accordance with the invention, the stud 201 is engaged by a first or inner part 204 and is movable only axially to pull the stud in the axial direction so as to elongate it and thereby to tension it in the object, or to relax the stud as will be explained hereinbelow. The inner part 204 is moved only axially by means of a second or outer part 203 which is connected with the inner part 204 and is movable in a transverse direction. A friction element 205 cooperates with at least one of the parts 203 and 204 so as to change friction between the parts 203 and 204 as will be explained hereinbelow.

The outer part 203 has an end portion 207 remote from the flange 202 and provided with splines 208 to be engaged by a tool. The outer part 203 also has a portion 209 which faces toward the flange 202 and has a surface 210 arranged to abut against the friction elements 205. Finally, the outer part 203 has an inner thread 211. The outer part 203 can be formed as a tubular member provided with the above specified formations.

The inner part 204 is a tubular member and has an end portion 212 remote from the flange 202 provided with a plurality of axially extending splines 213 to be engaged by a tool. The inner part also has an outer surface provided with an outer thread 214 which engages with the inner thread 211. The inner part 204 further has an end portion 215 which has an inner surface provided with axially extending splines 216. Finally, the inner part 204 has an inner surface provided with an inner thread 217 for engaging with the stud 201.

The friction element 205 is disc-shaped, in particular being stepped and including an outer annular portion 205', an inner annular portion 205" and a connecting portion 205''' extending between the outer and inner annular portions. The friction element on the one hand is located between the end portion 209 of the outer part 203 and the flange 202 and, on the other hand, surrounds the portion 215 of the inner part 204. The outer

surface of the inner annular portion 205* has an outer surface provided with a plurality of axially extending splines 218, which engage with the axially extending splines 216 of the end portion 215. Thus, the spline engagement between the inner part 204 and the friction element 205 is obtained inside the inner part 204. The friction element 205 has an end surface 219 against which the surface 210 of the outer part 203 abuts and also an opposite end surface 220 which abuts against the outer surface of the flange 202. Finally, the friction element 205 has an outer circumferential surface provided with a plurality of axially extending splines 221.

In order to elongate or relax the stud, a standard tool (not shown) is applied so that its drive part around the central axis engages the splines 208 of the outer part 203 to turn the latter while a reaction part of the tool connected to the immovable housing of the tool surrounding the drive part, engages the splines 221 of the friction element 205 so as to at least hold the friction element in order to prevent its rotation. When the outer part 203 is turned in one direction about this axis, the inner part 204 is displaced axially upwards (in Figure 3) with sliding along the axially extending splines 216, 218 of the portions 215 and 205*. The axial upward displacement of the inner part 204 without turning about the axis, causes pulling of the stud 201 upwardly so that it elongates.

Finally, a device in accordance with another embodiment is shown in Figure 4 and is used for elongating and relaxing a stud 301 which is arranged in an outside object such as a flange 302 or the like. The stud 301 is engaged by a first or inner part 304 and is movable only axially either to pull the stud in the axial direction so as to elongate it and thereby to tension it in the object or to relax the stud as will be explained hereinbelow. The inner part 304 is moved only axially by means of a second or outer part 303 which is connected with the inner part 304 and is movable in a transverse direction. A friction element 305 cooperates with at least one of the parts 303 and 304 so as to change friction between the parts 303 and 304 as will be explained hereinbelow.

The outer part 303 has a cylindrical peripheral surface 307 provided with axially extending splines 308 to be engaged by a tool. The outer part 303 also has an end portion 309 facing toward the flange 302 and having an end surface 310 arranged to abut against the friction element 305. Finally, the outer part 303 has an inner thread 311. The inner part 304 has an outer surface 312 provided with an outer thread 313 which engages with the inner thread 311.

The inner part 304 further has a portion 314 which has an outer surface 315 provided with axially extending splines 316. Finally, the inner part 304 has an inner surface provided with an inner thread 317 for engaging with the stud 301.

The friction element 305 is disc-shaped and on the one hand is located between the end portion 309 of the outer part 303 and the flange 302 and, on the other

hand, surrounds the portion 314. The friction element 305 has an inner surface provided with a plurality of axially extending splines 318 which engage with the axially extending splines 316 of the portion 314. The friction element 305 has an end surface 319 against which the end surface 310 of the outer part 303 abuts, and also an opposite end surface 320 which abuts against the outer surface of the flange 302. Finally, the friction element 305 has an outer circumferential surface provided with a plurality of axially extending splines 321.

In order to elongate or relax the stud a standard tool T (shown in dashed lines in Figure 4) is applied so that its drive part D around the central axis engages the outer splines 308 of the outer part 303 to turn the latter while a reaction part R of the tool, which can be connected, for example, to the immovable housing of the tool which surrounds the drive part D, engages the outer splines 321 of the friction element 305 so as to at least hold the friction element in order to prevent its rotation. When the outer part 303 is turned in a given direction about its axis, the inner part 304 is displaced axially upwards (in Figure 4) along the cooperating axial splines 316, 318, but does not displace in the transverse direction or in other words it does not turn around the axis. The axial upward displacement of the inner part 304 without the transverse displacement (turning around the axis) causes pulling of the stud 301 upwardly and therefore it is subjected to an elongating force.

As mentioned hereinabove, at least a holding force is applied to the friction element 305. However, it is possible to apply to the friction element 305 an active force which acts in a direction opposite to the direction of action of the active force applied to the outer part 303. In other words when one active force, for example the force applied to the outer part 303, acts in a clockwise direction, the force applied to the friction element 305 acts in the counterclockwise direction.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of methods and constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a method of and a device for elongating and relaxing a stud, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the present invention.

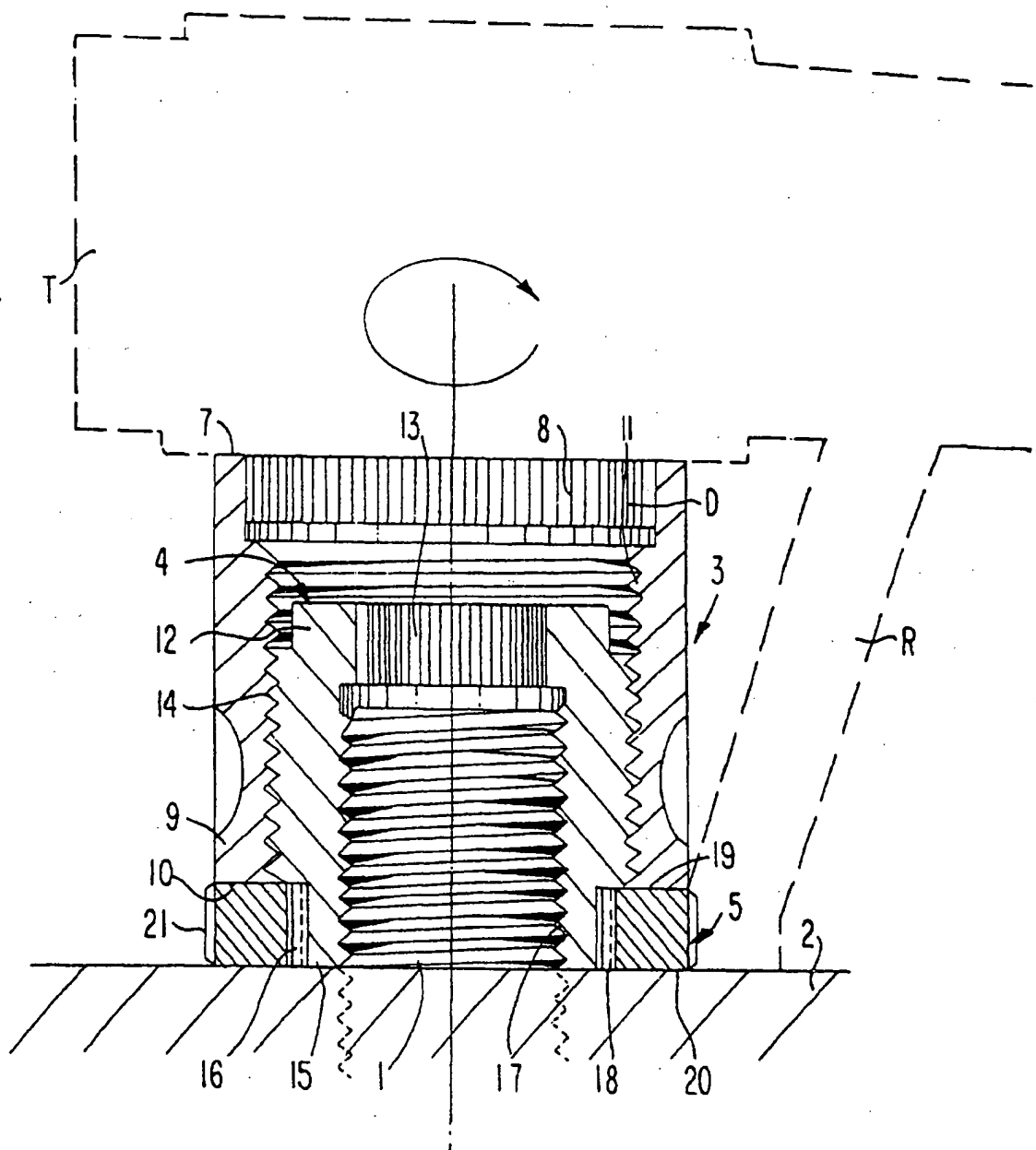
Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

Claims

1. A method of elongating and relaxing a stud (1) having an axis and arranged in an object (2), characterised in that the method comprises the steps of connecting the stud with a first part (4) which is movable only axially so as either to pull the stud in an axial direction to elongate the stud and thereby to tension it in the object (2) or to relax the stud (1); moving the first part (4) only axially by connecting the first part with a second part (3) which is moveable in a transverse direction; connecting a friction element (5) with the first part (4) so that the first part (4) has more surfaces cooperating with other elements and subjectable to friction during movement than the second part (3) and so that the second part (3) is not connected with the friction element (5) but instead is freely turnable relative to the friction element (5) while freely abutting against the friction element (5); and applying at least a holding force to the friction element via first engaging means (R) and simultaneously applying an opposite active force to the second part (3) via second engaging means (8) whereby the second part (3) is moved in the transverse direction, the friction element (5) does not move, and the first part (4) is moved axially to move the stud (1) axially without turning to elongate or relax the stud (1).
2. A method according to claim 1, characterised in that the step of connecting the first part (4) with the stud (1) is performed by first thread means (17) and the step of connecting the first part (4) with the second part (3) is performed by second thread means (11,14).
3. A method according to claim 1 or 2, characterised in that it further comprises the step of arranging the friction element (5) between the object (2) and an end portion (9) of the second part (3) which faces the object (2) so that the friction element (5) surrounds an end portion (15) of the first part (4) which faces the object (2).
4. A method according to any of the preceding claims, characterised in that said step of applying a force includes engaging the second part (3) with a tool (T) and moving the second part (3) with the tool in the transverse direction.
5. A method according to any of claims 1 to 3, characterised in that said applying the holding force includes engaging the friction element (5) by a tool and holding the friction element (5) immovably in the transverse direction.
6. A method according to claim 1, characterised in that it further comprises the step of providing first connecting means (111,113) for connecting the first part (104) with the second part (103) so that the second part (103) moves in the transverse direction, and second connecting means (117,118) axially spaced from the first connecting means (111,113) and connecting the first part (104) with the friction element (105) so that the first part (104) moves only axially.
7. A method according to claim 6, characterised in that said applying said opposite active force includes engaging the second part (103) with an inner socket (120) of a tool and engaging the friction element (105) with an outer socket (123) of the tool which is rotatable relative to the inner socket (120).
8. A method according to claim 7, characterised in that said engaging the second part (103) with the inner socket (120) includes providing further engaging means (108) on an axial end portion (107) of the second part (103), providing on an opposite axial end portion (121) of the inner socket (120) further engaging formations (122), and engaging the further engaging means (108) of the second part (103) with the further engaging formations (122) of the inner socket (120), and in that said engaging the friction element (105) with the outer socket (123) includes providing on an outer peripheral surface of the friction element (105) additional engaging means (125), providing on an inner peripheral surface of the outer socket (123) additional engaging formations (124), and engaging said additional engaging means (125) with said additional engaging formations (124).
9. A method according to claim 1, characterised in that said connecting of the friction element (205) with the first part (204) includes connecting the friction element (205) with the first part (204) radially inside the first part.
10. A method according to claim 1, characterised in that said applying the opposite active force to the second part (303) includes applying the opposite active force to an outer peripheral portion of the second part (303) provided with the second engaging means (308).
11. A device for elongating and relaxing a stud (1) having an axis and arranged in an object (2), characterised in that it comprises a first part (4) connectable with the stud (1) and movable only axially so as to pull the stud (1) in an axial direction to elongate the stud and thereby to tension it in the object or to relax the stud; a second part (3) provided for moving said first part (4) axially and, for this purpose, connected with said first part (4), said second part (3) being movable in a transverse direction; a friction element (5) connected with said first part (4) so that

- said first part (4) has more surfaces cooperating with other elements and subjectable to friction during movement than said second part (3) and so that said second part (3) is not connected with said friction element (5) but instead is freely turnable relative to said friction element (5) while freely abutting against the friction element (5), said friction element (5) having first engaging means (21) formed so that at least a holding force is applicable to said friction element (5) through said first engaging means (21), while said second part (3) has second engaging means (8) to which an opposite active force is simultaneously applicable, so that when said second part (3) is moved in said transverse direction and said friction element (5) is held immovably, said first part (4) is moved axially to move the stud (1) axially without turning so as to elongate or relax the stud.
12. A device according to claim 11, characterised in that it further comprises first thread means (17) connecting said first part (4) with the stud (1), and second thread means (12,14) connecting said first part (4) with said second part (3).
 13. A device according to claim 11 or 12, characterised in that said friction element (5) is arranged between the object (2) and an end portion (9) of said second part (3) which faces the object so that said friction element (5) surrounds an end portion (15) of said first part (4) which faces the object (2).
 14. A device according to any of claims 11 to 13, characterised in that said second engaging means (8) of said second part (3) is formed so that said opposite active force is applicable to said second part (3) by engaging said second engaging means of said second part by a tool (T) so as to move said second part (3) by the tool in the transverse direction.
 15. A device according to claim 11, characterised in that said first engaging means (21) is formed so that said first holding force is applicable to said friction element (5) by engaging said first engaging means (21) with a tool so as to hold said friction element (5) during movement of said second part (3) in said transverse direction.
 16. A device according to claim 11, characterised in that it further comprises an inner socket (120) provided with further engaging formations (122) engageable with said second engaging means (108), and an outer socket (123) rotatable relative to said first socket (120) and provided with additional engaging formations (124) engageable with said first engaging means (125) of said friction element (105).
 17. A device according to claim 16, characterised in that said second engaging means (122) of said second part (103) are provided on an end portion (108) of said second part (103), in that said further engaging formations (122) of said first socket (120) are provided on an opposite end portion (121) of said first socket (120), in that said first engaging means (125) of said friction element (105) are provided on an outer peripheral surface of said friction element, and in that said additional engaging formations (124) of said second socket (123) are provided on an inner peripheral surface of said second socket.
 18. A device according to claim 11, characterised in that said friction element (205) is connected with said first part (204) radially inside said first part.
 19. A device according to claim 11, characterised in that said second part (303) has an outer peripheral surface (307) provided with second engaging means (308) to which the opposite active force is applied.

FIG. 1



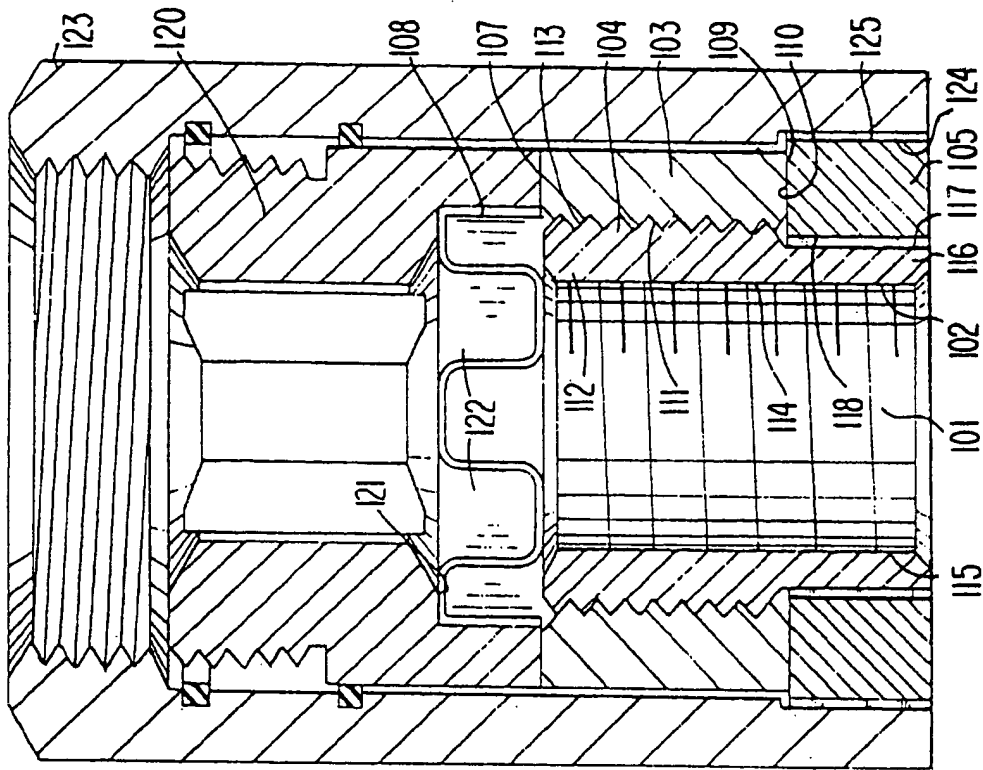


FIG. 2a

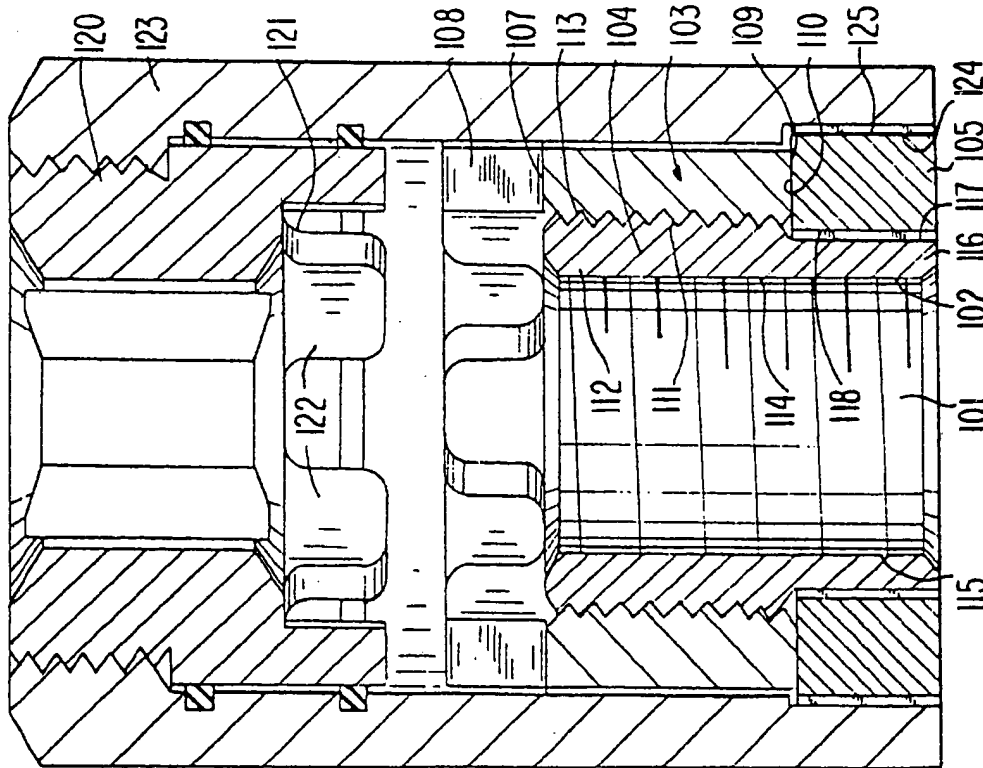


FIG. 2b

FIG.3

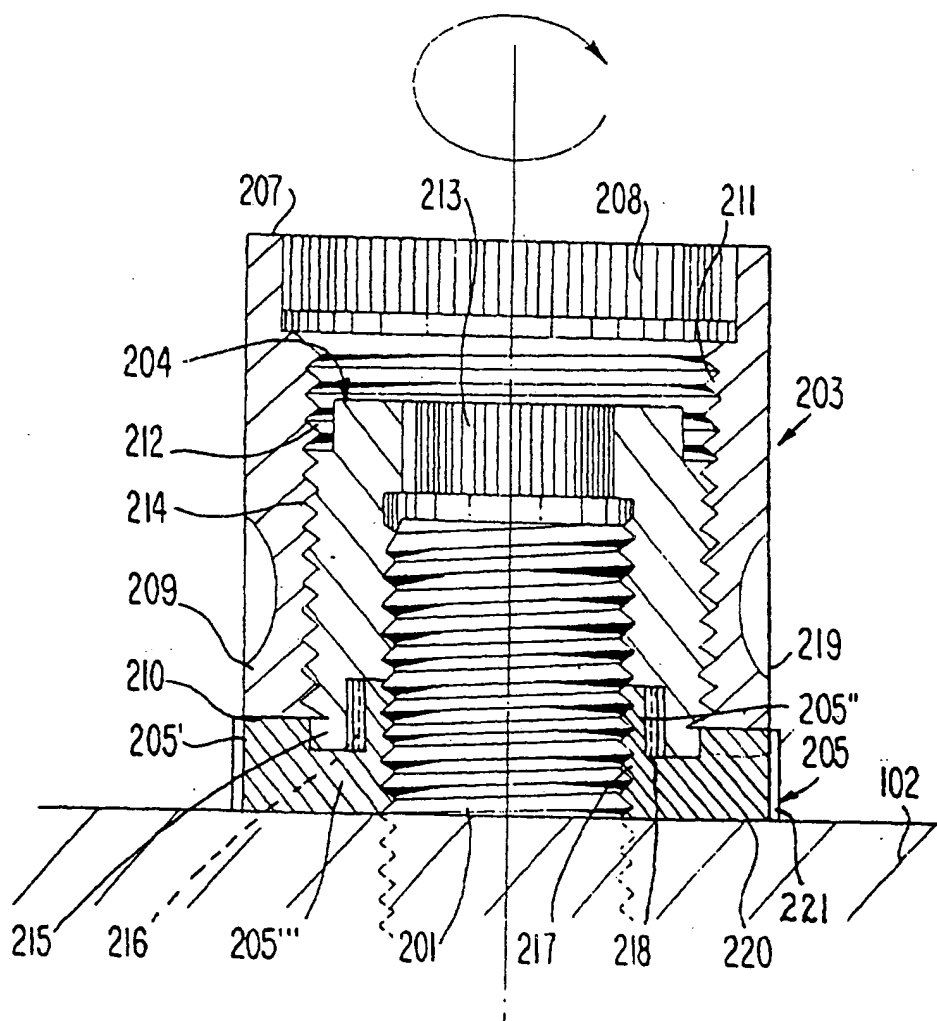
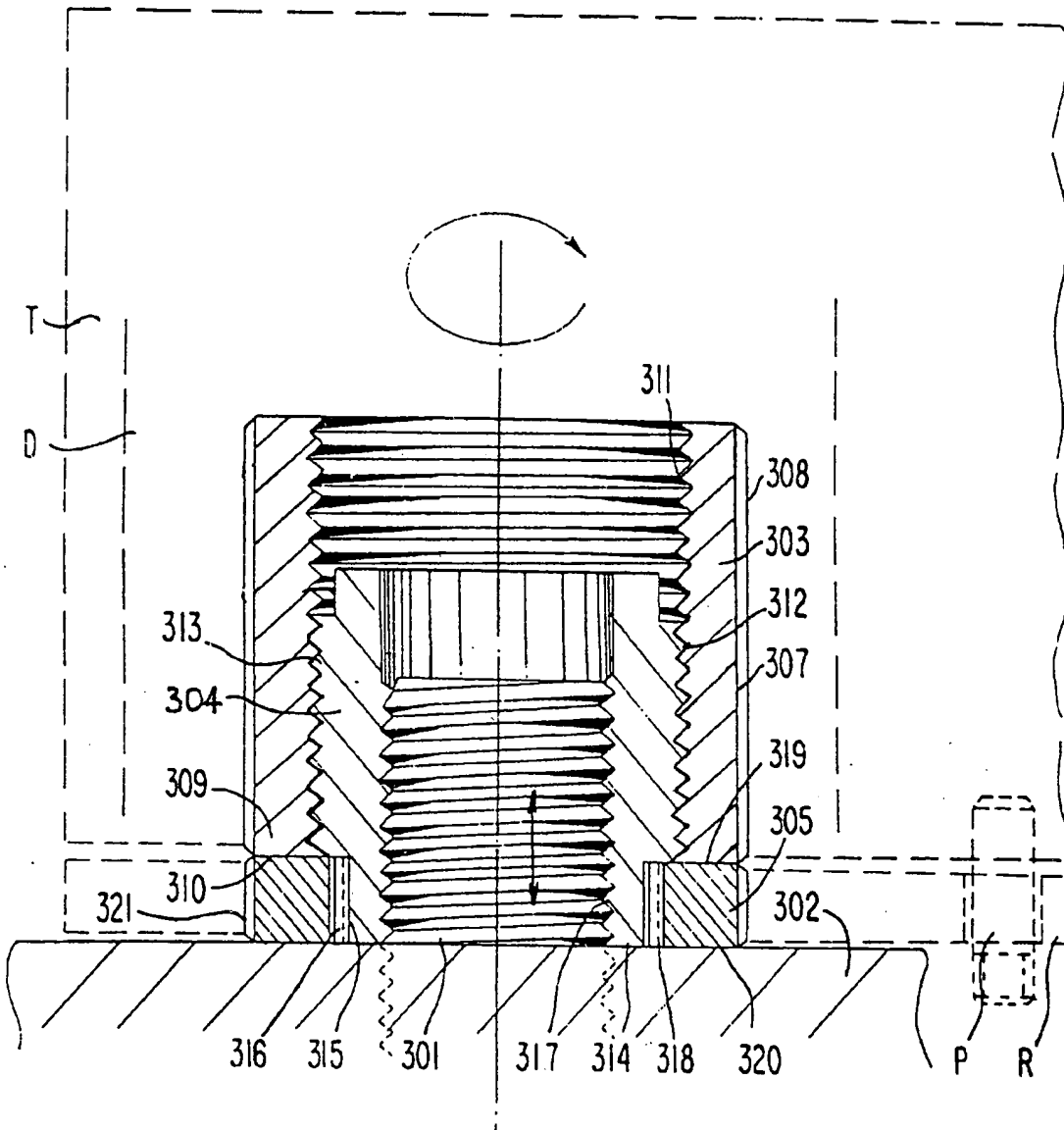


FIG. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 30 7512

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|---|---|---|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
| D,A | US-A-5 341 560 (JUNKERS) * the whole document * --- | 1-4,6,7, 11-14 | F16B31/04 |
| A | WO-A-92 03666 (JUNKERS) * page 8, line 9 - page 16, line 3; figures 1-22 * ----- | 1,2,6, 11,12 | |
| | | | TECHNICAL FIELDS SEARCHED (Int.Cl.6) |
| | | | F16B |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 5 February 1996 | Examiner Calamida, G |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>..... & : member of the same patent family, corresponding document</p> | | | |

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